

General Maintenance Procedures

Clean the unit with a mild non-abrasive household cleansing product. Be gentle—do not scrub. Do not spray the cleansing agent into the drive area or keyboard.

Use a cotton swab to clean around the drives and keyboard. Do not attempt to clean inside of the drive mechanism.

Use a commercial solvent-type disk head cleaning kit to clean the drive heads. These kits contain a special cleaning diskette and are available from your dealer.

Do not attempt to manually clean the drive heads.

Environmental Considerations

Even the best computer designs can malfunction if environmental specifications are exceeded. Improper power cords, fuses, and voltage selection can cause the machine to malfunction.

Use only those voltage selections, fuse sizes, and power cords that are recommended in the Attache Operator's Guide.

Temperature extremes can also cause problems. Diskettes, for example, will only function properly in the temperature range 50 to 125 degrees F and 10 to 51 degrees C.

If diskettes are exposed to temperatures outside of these ranges for extended periods, let them acclimate at room temperature for a short time prior to using them.

While Attache is not as temperature sensitive as the diskettes, the unit may not boot following exposure to extreme temperatures. If this occurs, let the unit acclimate at room temperature for a short time prior to booting the system.

Diagnostic Programs

Section 2

All diagnostic programs for troubleshooting and performance verification are contained in the Attache Resident Monitor, which is built into ROM.

Commands for running diagnostic programs are as follows:

G —Display Pattern Test	R —Main Memory Test
H —Display RAM Test	S —Select Output Port
I —Input Test	T —Clock Test
J —Jump	U —United Tests
K —Keyboard Test	V —Read Disk Sector*
L —Loop Tests	W —Write Disk Sector*
M —Memory Map Test	X —I/O Transmit Test
O —Output Test	Y —I/O Receive Test
P —Format Test*	Z —Disk Drive Test*
Q —CMOS Memory Test	

- * This test requires a diskette. Note that disk tests are only as reliable as the media being used. Be sure that the diskette being used in the test is functioning properly.

WARNING: P, W, and Z tests alter diskette contents. Do not use diskettes containing valuable data or programs when running these tests.

- ** The Q test will set default Set-up Mode parameters on some processor board versions. After the diagnostics have run to completion, you may have to reset the clock and activate the Set-up Mode to reset these parameters. Refer to the Q Test in this section for additional information.

Running the Diagnostic Programs

1. Power up the unit.
2. Insert diskettes in both drives. Use only blank diskettes or diskettes that do not contain important information that you wish to keep. The P, W, Z, and IZ tests will destroy the contents of the diskettes.
3. Open the Drive A door so that the system will not boot the diskette.
4. Press the **RESET** key at the same time as the **SHIFT** key on the right side of the keyboard.
5. The system will attempt to boot the diskette, sense that the drive door is open, and revert to terminal mode (No System on Disk — Now in Terminal Mode is displayed).
6. Close the Drive A door so that the drive tests will execute properly.
7. Press **CTRL** and **LINE FEED** simultaneously. @ on the screen indicates that monitor mode is active.
8. With monitor mode activated, type the letter for the individual test that you wish to run, or type **U** and press **RETURN** to run the United Tests.

The United Tests automatically execute the diagnostics that test the unit's main functions. These tests are as follows: **H** (Display RAM), **Q** (CMOS RAM), **T** (clock), **M** (memory map), **R** (main RAM), **Z** (drive A), and **IZ** (drive B). These tests run in approximately 20 minutes.

9. Refer to the individual tests in this section of the service guide for run times and errors that may be reported.

Note that the **Q** test will set default Set-up Mode parameters on some processor board versions. After the diagnostics have run to completion, you may have to reset the clock and activate the Set-up Mode to reset these parameters. Refer to the **Q** Test in this section for additional information.

Individual Tests

Any two or more diagnostic tests can be run sequentially as United tests by specifying the tests when the **U** Test is activated. You may also run the tests in a continuous loop by activating the **L** Test as the first letter in the command. Refer to the **L** Test and **U** Test discussions in this section of the Service Guide.

G — Display Pattern Test

Format: G (no parameters)

Function: Tests the display by filling the screen with the character "+" in each position except the cursor position (lower right corner).

Run Time: Less than 3 seconds.

Exit: Press any key.

Reports: None.

Failures: Suspect (1) loose cables, (2) CRT display module, (3) processor board module.

H — Display RAM Test

Format: H (no parameters)

Function: Tests all data bits in all locations of the alphanumeric, graphic, and attribute display memories.

Run Time: Less than 3 seconds.

Exit: Automatic at end of test.

Reports: Errors are reported in the format "llccddff", where:

ll = the line containing the error

cc = the character position of the error

dd = the bit position(s) in error (in binary ones)

ff = the frame in which the error is found.

Frame 00-80 = graphics RAM
CO = alphanumeric RAM
EO = attribute RAM

Note: The frame code corresponds directly to the display memory IC's on the processor board as follows:

00-U704 40-U706 80-U708 EO-U432
20-U705 60-U707 CO-U433

Failures: Suspect (1) loose cables, (2) processor board module.

I — Input Test

Format: ppl

Function: Reads one byte of data from the port specified in "pp". This test can be used in conjunction with the ouput command to read status or data from a port.

Run Time: Less than 3 seconds.

Exit: Automatic after byte is read.

Reports: One byte of data is displayed.

Failures: Suspect (1) operator error, (2) loose cables, (3) processor board module.

J — Jump

Format: addrJ

Function: Jumps to the specified address and begins program execution. Control returns to Monitor Mode if a RETURN is encountered and the stack has not been altered and the EPROM is still enabled.

If no address is specified and a system diskette is inserted in drive A, a system boot occurs. Otherwise the system enters Terminal Mode.

Run Time: Less than 3 seconds.

Exit: None.

Reports: None.

Failures: Suspect (1) operator error, (2) loose cables, (3) processor board module.

K — Keyboard Test

Format: K (no parameters)

Function: Displays each key that is pressed, followed by its hexadecimal value. Note that both upper and lower case codes may be returned.

Run Time: Less than 3 seconds.

Exit: Type the character ^ to exit.

Reports: None.

Failures: Suspect (1) loose cables, (2) keyboard module, (3) processor board module.

L — Loop Tests

Format: L (test)

Function: Runs the test entered after "L" continuously.

Run Time: Runs the test continuously until you exit.

Exit: Press any key.

Reports: The test being "looped" reports as normal.

Failures: Refer to the failed test.

M — Memory Map Test

Format: Maps the memory in the reverse of standard order, with the numbers 7-1 written in the first location of virtual blocks 1-7 respectively.

Memory is then remapped to the standard configuration and the numbers are read back. Read-back values should then be 1-7 for the corresponding blocks.

Run Time: Less than 3 seconds.

Exit: Automatic at end of test.

Reports: Any virtual block that returns an erroneous number is reported in the format vn, where "v" is the virtual block number and "n" is the number returned.

Failures: Suspect (1) loose cables, (2) processor board module, (3) power supply module.

O — Output Test

Format: ppddO ("O" not "0")

Function: Outputs one data byte to a port, where "pp" is the port and "dd" is the data to send. Can be used in conjunction with the input command to send data to a port and then read status or data from the port.

For example: F2440 sends ASCII character "D" to the printer port.

Run Time: Less than 3 seconds.

Exit: Automatic after byte is sent.

Reports: None.

Failures: Suspect (1) operator error, (2) loose cables, (3) processor board module.

P — Format Diskette Test

Format: P(n) where "n" is the drive number (P = A, 1P = B).

Warning: This test will alter diskette contents. Do not use diskettes containing valuable data or programs when running this test.

Function: Formats the diskette in the specified drive.

Run Time: Less than 35 seconds.

Exit: Immediately by pressing any key, or automatically when formatting is complete.

Reports: None.

Note: The format produced is not the same optimized format that FORMAT.COM produces with CP/M. Use this routine for test purposes only.

Failures: Suspect (1) write-protect tab, (2) bad diskette, (3) dirty drive heads, (4) disk drive module, (5) processor board module, (6) power supply module.

Q — CMOS RAM Test

Format: Q (no parameters)

Function: Tests all CMOS RAM locations with a test of each data bit.

Run Time: Less than 3 seconds.

Exit: Automatic at end of test.

Reports: Any bad location is reported in the format "aadd", where "aa" is the address (0-3F) and "dd" is the failed bits (0-F).

Note: This test may reset CMOS RAM to its default values, depending upon the EPROM version of the system. If the Terminal Mode header is "Otrona Attache," the Set-up Mode parameters will reset to their default settings. If the header is "Otrona Attache x" (where "x" is any letter), the parameters will remain at their current settings.

Failures: Suspect (1) loose cables, (2) clock batteries, (3) processor board module, (4) power supply module.

R — Main RAM Test

Format: nR, where "n" is the RAM row number (0-3).

Function: Main RAM consists of four rows (0-3) of 16K RAM chips. R Test maps the block under to virtual memory area 8000-BFFF hex and checks all locations with every data bit.

Run Time: Less than 3 minutes.

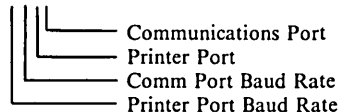
Exit: Automatic at end of test.

Reports: The first nine errors found are reported as aaaa-dd, where "aaaa" is the relative address of the bad location (from the beginning of the row) and "dd" indicates the data bits in error.

Failures: Suspect (1) loose cable connections, (2) processor board module, (3) power supply module.

S — Select Output Ports

Format: bbpcS



0 = deselect

1 = select

Baud Rate Table:

0 = not changed	5 = 1200 Baud
1 = 110 Baud	6 = 2400 Baud
2 = 150 Baud	7 = 4800 Baud
3 = 300 Baud	8 = 9600 Baud
4 = 600 Baud	9 = 19200 Baud

Function: Selects the printer and communications ports to print test commands and results. Selections made here will also apply to input and output via the X and Y (transmit and receive) commands.

If terminal mode is then entered from monitor mode, the selections will remain in force.

If neither port is selected, default is to the communications port. If both ports are selected, input is accepted from either and output is sent to both.

Run Time: Less than 3 seconds.

Exit: Automatic after setting ports.

Reports: None.

Failures: Suspect (1) operator error, (2) loose cables, (3) processor board module.

T — Real-Time Clock Test

Format: T (no parameters)

Function: Tests the real-time clock for basic function without disturbing the current clock setting.

Run Time: Less than 3 seconds.

Exit: Automatic at end of test.

Reports: A question mark is displayed if the clock fails.

Failures: Suspect (1) clock not set, (2) clock batteries, (3) processor board module, (4) power supply module.

U — United Tests

Format: U (test [s]) RETURN

Function: Runs specified tests in sequence.

For example, UHQT runs the Display RAM, CMOS RAM, and Real-Time Clock Tests in sequence.

If no test is specified, H, Q, M, T, R, 1R, 2R, 3R, Z, and 1Z are run sequentially.

Note that the U command may be preceded by the L command to cause a continuous loop of tests (LU. . .).

Run Time: Refer to individual tests.

Exit: Automatic at end of tests, or immediately by pressing any key.

Reports: Each test reports as normal.

Failures: Refer to failed test.

V — Read a Sector from a Disk

Format: cchsV

Diagram illustrating the format of the V command: cchsV

```
graph LR
    cchsV[cchsV] --- c[c]
    c --- cylinder[cylinder number]
    c --- cylinder_hex["(0-27 hex)"]
    cchsV --- h[h]
    h --- head[head]
    h --- head_list["0 = drive 0, head 0  
1 = drive 1, head 0  
4 = drive 0, head 1  
5 = drive 1, head 1"]
    cchsV --- s[s]
    s --- sector[sector number]
    s --- surface[surface]
```

sector number

surface

0 = drive 0, head 0
1 = drive 1, head 0
4 = drive 0, head 1
5 = drive 1, head 1

cylinder number
(0-27 hex)

Function: Reads the specified disk sector into the memory space FE00-FFFF hex (512 bytes).

Run Time: Less than 5 seconds.

Exit: Automatic at end of transfer.

Note: Use this test with CP/M formatted diskettes only.

Reports: Data is still sent to memory when an error occurs, but the data is sent incorrectly. Any error detected in the transfer is reported as "cchs-ssee", where:

cchs = the sector selection as input
ss = controller status register ST0 (see table)
ee = controller status register ST1 (see table)

ssee is interpreted as (X = Don't Care)

0000 = error in data transfer from controller to RAM.

2X0X = Error caused by: drive select jumper missing, door not closed / head not loaded, no disk in logged drive, or disk not spinning properly.

4X01 = Missing address mark.

4X04 = Missing sector ID.

4X20 = CRC error in data or ID field.

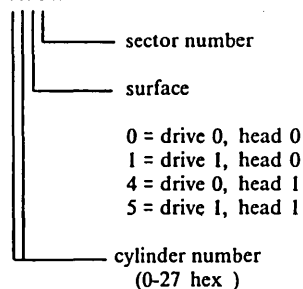
4800 = Drive not ready.

Any other code indicates an error caused by the floppy controller.

Failures: Suspect (1) operator error, (2) bad diskettes, (3) dirty disk drive heads, (4) loose cables, (5) disk drive module (6) processor board module, (7) power supply module.

W — Write a Sector to a Disk

Format: cchsW



Warning: This test will alter diskette contents. Do not use diskettes containing valuable data or programs when running this test.

Function: Writes to the specified disk sector from the memory space FE00-FFFF hex (512 bytes).

Run Time: Less than 5 seconds.

Exit: Automatic at end of transfer.

Reports: Any error detected in the transfer is reported as "cchs-ssee", where:

cchs = the sector selection as input
ss = controller status register ST0 (see table)
ee = controller status register ST1 (see table)

ssee is interpreted as (X = Don't Care)

0000 = error in data transfer from controller to RAM.

2X0X = error caused by: drive select jumper missing, door not closed / head not loaded, no disk in logged drive, or disk not spinning properly.

4X01 = Missing address mark.

4X04 = Missing sector ID.

4X20 = CRC error in data or ID field.

4800 = Drive not ready.

Any other code indicates an error caused by the floppy controller.

Failures: Suspect (1) write-protect tab, (2) operator error, (3) bad diskettes, (4) dirty disk drive heads, (5) disk drive module, (6) processor board module, (7) power supply module.

X — I/O Port Transmit

Format: nnnmmmmx, where “nnnn” is the hexadecimal number of bytes to transmit and “mmmm” is the starting memory address from which to transmit.

Function: Transmits data through the port(s) selected by the S command to another system in Y (receive) test mode.

Data format is as follows:

CR
nn
nn
.
.
nn
CR

Where “nn” is two characters per data byte, sent in pseudo-hex (0,1,2,3,4,5,6,7,8,9,;,:,<,>,?), with the most significant digit sent first.

Run Time: Depends upon amount of data to transfer.

Exit: Automatic at end of data transfer.

Reports: None.

Failures: Suspect (1) operator error, (2) loose cables, (3) processor board module, (4) power supply module.

Y — I/O Port Receive

Format: nnnY, where “nnnn” is the starting address for the data to load.

Function: Receives data through the port(s) selected by the S command from another system in X (transmit) test mode.

Run Time: Depends on amount of data to transfer.

Exit: Automatic at end of data transfer.

Reports: None.

Failures: Suspect (1) operator error, (2) loose cables, (3) processor board module, (4) power supply module.

Note: A subroutine which may be used to emulate the Attache Y Test on other systems is as follows:

	CR	=	0DH
CD 07C3	CY:	CALL	CI;WAIT FOR CR
FE0D		CPI	CR
20F9		JRNZ	CY
CD 07C3	L1:	CALL	CI;TAKE DATA
FE0D		CPI	CR
CA 0610		RZ	
E60F		ANI	0FH;ELSE STORE
07		RLC	
07		RLC	
07		RLC	
07		RLC	
57		MOV	D,A
CD 07C3		CALL	CI
E60F		ANI	0FH
B2		ORA	D
77		MOV	M,A
23		INX	H
18E7		JMPR	L1

CI: User Port Input Routine

Z — Automatic Disk Test

Format: nZ, where "n" is the drive number (Z = A, 1Z = B).

Warning: This test will alter diskette contents. Do not use diskettes containing valuable data or programs when running this test.

Note: Both Z and 1Z tests require a diskette inserted in Drive A. 1Z also requires a diskette in Drive B.

Function: Tests the diskette in the specified drive. The entire contents of the diskette are erased on both sides during this test. Errors are reported if defective media are used. The test sequence is as follows:

1. The diskette is formatted with E5.
2. A "worst-case" test pattern is written in sector 1 of each track on side 0.
3. The test pattern is read back from sector 1 of each track of side 0.
4. Steps 2 and 3 are repeated for each sector on the side.
5. Steps 2 through 4 are repeated for side 1.

Run Time: Less than 6 minutes.

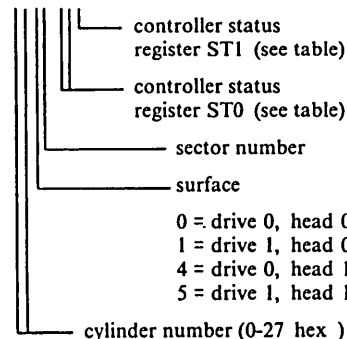
Exit: Automatic at end of test.

Note: Disk tests are only as reliable as the media being used. Be sure that the diskette being used in the test is functioning properly.

A dirty head surface will cause errors during Z Test. If the test fails, use a commercial solvent type head cleaning solution to clean the heads. With the cleaning diskette in Drive A, run Z Test again. With the cleaning diskette in Drive B, run 1Z Test. The test will stop in less than 40 seconds. Then run Z Test again, using a normal system diskette.

Reports: Errors are reported in the following format:

cchs-ssee



cchs = the sector selection as input
ss = controller status register ST0 (see table)
ee = controller status register ST1 (see table)

ssee is interpreted as (X = Don't Care)

0000 = error in data transfer from controller to RAM.

2X0X = error caused by: drive select jumper missing, door not closed / head not loaded, no disk in logged drive (no disk in drive A while running 1Z), or disk not spinning properly.

4X01 = Missing address mark.

4X04 = Missing sector ID.

4X20 = CRC error in data or ID field.

4800 = Drive not ready.

Any other code indicates an error caused by the floppy controller.

Failures: Suspect (1) write-protect tab, (2) operator error, (3) bad diskettes, (4) dirty disk drive heads, (5) disk drive module, (6) processor board module, (7) power supply module.

NEC 765 Status Register Identification Table

Status Register 0

NO.	NAME	SYMBOL	DESCRIPTION
D7	Interrupt Code	IC	D7 = 0 and D6 = 0 Normal termination of command (NT). Command was completed and properly executed.
D6			D7 = 0 and D6 = 1 Abnormal termination of command (AT). Execution of command was started, but was not successfully completed. D7 = 1 and D6 = 0 Invalid command issue (IC). Command which was issued was never started. D7 = 1 and D6 = 1 Abnormal termination because during command execution the ready signal from FDD changed state.
D5	Seek End	SE	When the FDC completes the SEEK command, the flag is set to 1 (high).
D4	Equipment Check	EC	If a fault signal is received from the FDD, or if the Track 0 signal fails to occur after 77 step pulses (Recalibrate Command), then this flag is set.

NO. NAME SYMBOL DESCRIPTION

D3	Not Ready	NR	When the FDD is in the not ready state and a read or write command is issued, this flag is set.
D2	Head Address	HD	This flag is used to indicate the state of the head at Interrupt.
D1	Unit Select 1	US 1	This flag indicates a Drive Unit number at Interrupt.
D0	Unit Select 0	US 0	This flag indicates a Drive Unit number at Interrupt.

Status Register 1

NO. NAME SYMBOL DESCRIPTION

D7	End of Cylinder	EN	This flag is set when the FDC tries to access a sector beyond the final sector of a cylinder.
D6			Not used. This bit is always 0 (low).
D5	Data Error	DE	This flag is set when the FDC detects a CRC error in either the ID field or the data field.
D4	Over Run	OR	This flag is set if the FDC is not serviced within a certain interval by the main systems during data transfers.

D3 Not used. This bit is always 0 (low).

D2 No Data ND This flag is set if the FDC cannot find the sector specified in the IDR Register during execution of READ DATA, WRITE DELETED DATA or SCAN commands.

During execution of READ ID, this flag is set if the FDC cannot read the ID field without an error.

During execution of the READ A CYLINDER command, this flag is set if the starting sector cannot be found.

D1 Not Ready NW This flag is set if the FDC detects a write protect signal from the FDD during execution of WRITE DATA, WRITE DELETED DATA, or FORMAT A CYLINDER commands.

D0 Missing Address Mark MA This flag is set if the FDC cannot detect the ID Address Mark after encountering the index hole twice.

If the FDC cannot detect the Data Address Mark or Deleted Data Address Mark, this flag is set.

Swapping Modules

Section 3

The following pages describe the correct procedures for removing and installing each of the Attache component modules. A Phillips screwdriver is the only tool required for removal and installation of these modules.

WARNING — HIGH VOLTAGE

HIGH VOLTAGE IS PRESENT WHENEVER ATTACHE IS POWERED ON. ALWAYS UNPLUG THE UNIT PRIOR TO REMOVING THE CABINET.

Cabinet Removal

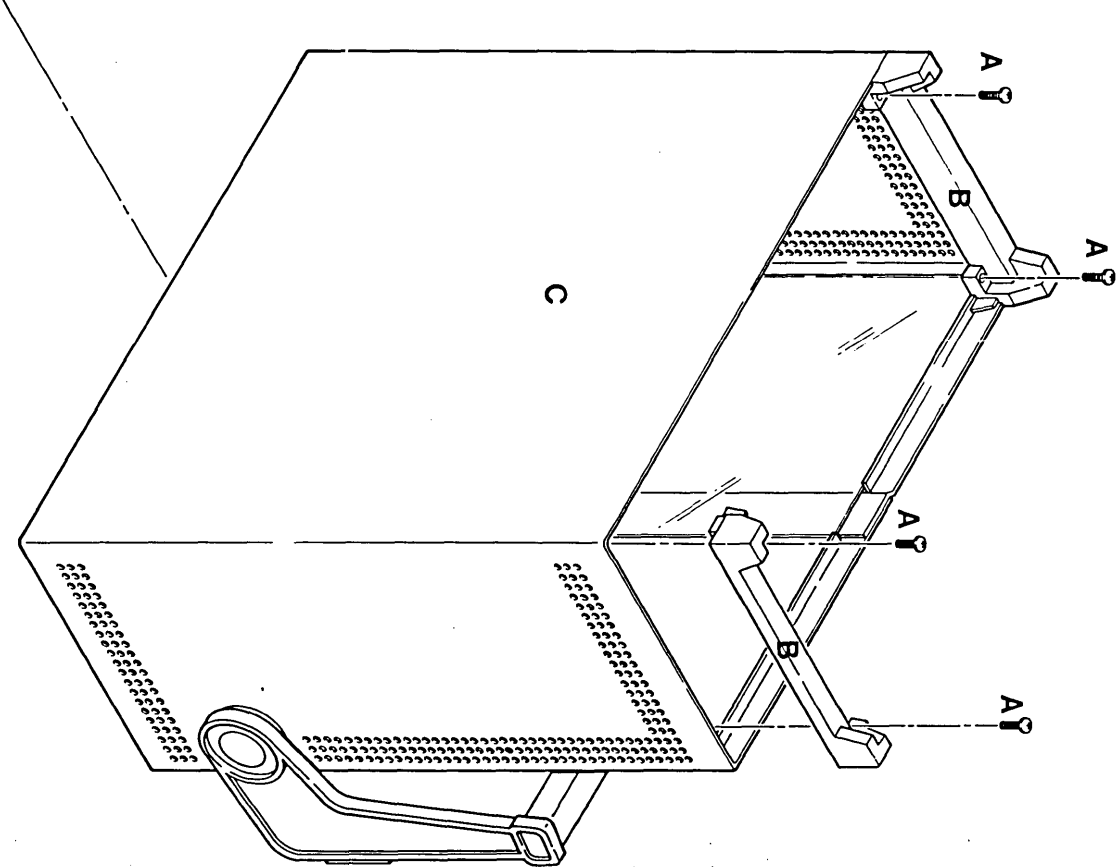
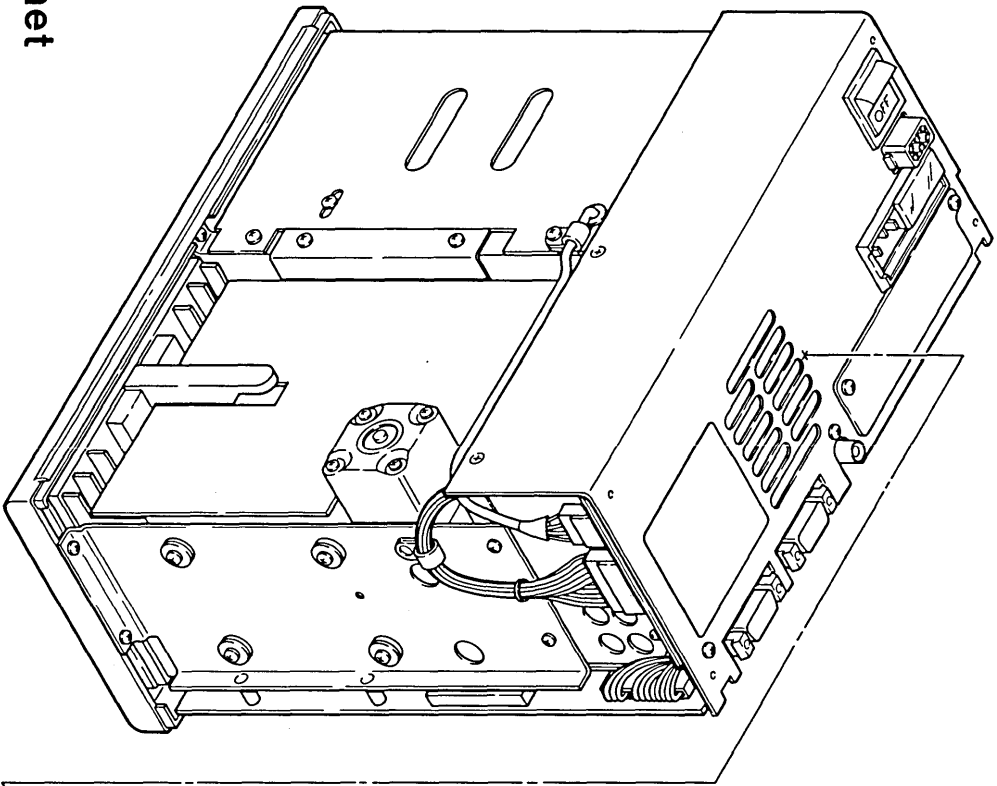
1. Separate the keyboard cable from the main unit and place Attache face down on a soft surface to avoid scratching the cabinet.
2. Loosen and remove the four #6-32 x .500 Phillips screws (A) from the back of the unit.
3. Remove the rear computer feet (B).
4. Gently slide the cabinet (C) up from the main unit until it is clear of the computer. Be careful when sliding the cabinet as it may bind when clearing the processor board. Do not force. Some wiggling may be necessary.

Cabinet Installation

1. With Attache face down, gently slide the cabinet (C) over the unit. Be careful when sliding the cabinet as it may bind on the processor board or it may disconnect the CRT or disk drive power cables. Do not force. Some wiggling may be necessary.
2. Before installing the feet, plug the unit in and power up to insure that the power cables are connected. Check the cable position by viewing through the holes on the right rear side of the cabinet. Listen for disk drive operation and check that the CRT display is functioning.
3. Align the rear computer feet (B) and insert the four #6-32 x .500 Phillips screws (A) through the feet. Tighten the screws.
4. Attach the keyboard and keyboard cable to the unit.

WARNING — HIGH VOLTAGE

HIGH VOLTAGE IS PRESENT WHENEVER ATTACHE IS POWERED ON. ALWAYS UNPLUG THE UNIT PRIOR TO REMOVING THE CABINET.



Cabinet

Processor Board Module Removal

Note: If the unit contains the optional multifunction board, remove that board prior to removing the processor board module.

1. Remove the cabinet from the unit.
2. Loosen 10 of the 12 #4-40 x .500 Phillips screws (A) from the bottom of the processor board (B). Do not remove the two screws (C) that connect the expansion connector to the processor board (see illustration).
3. Disconnect the flat-ribbon disk drive cable (D) by pressing the eject tabs on either side of the connector.
4. Disconnect the 11-pin power supply cable (E).
5. Remove all screws (A) and split-lock washers (F) that were loosened above.
6. Lift out the processor board.

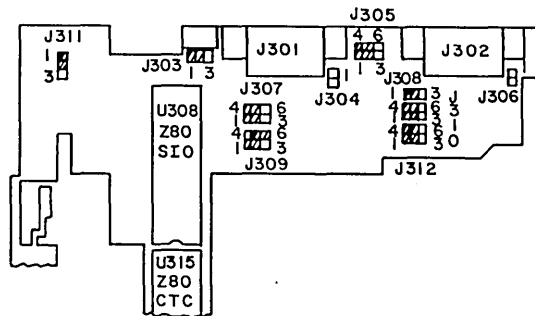
Jumper Locations for Processor Board

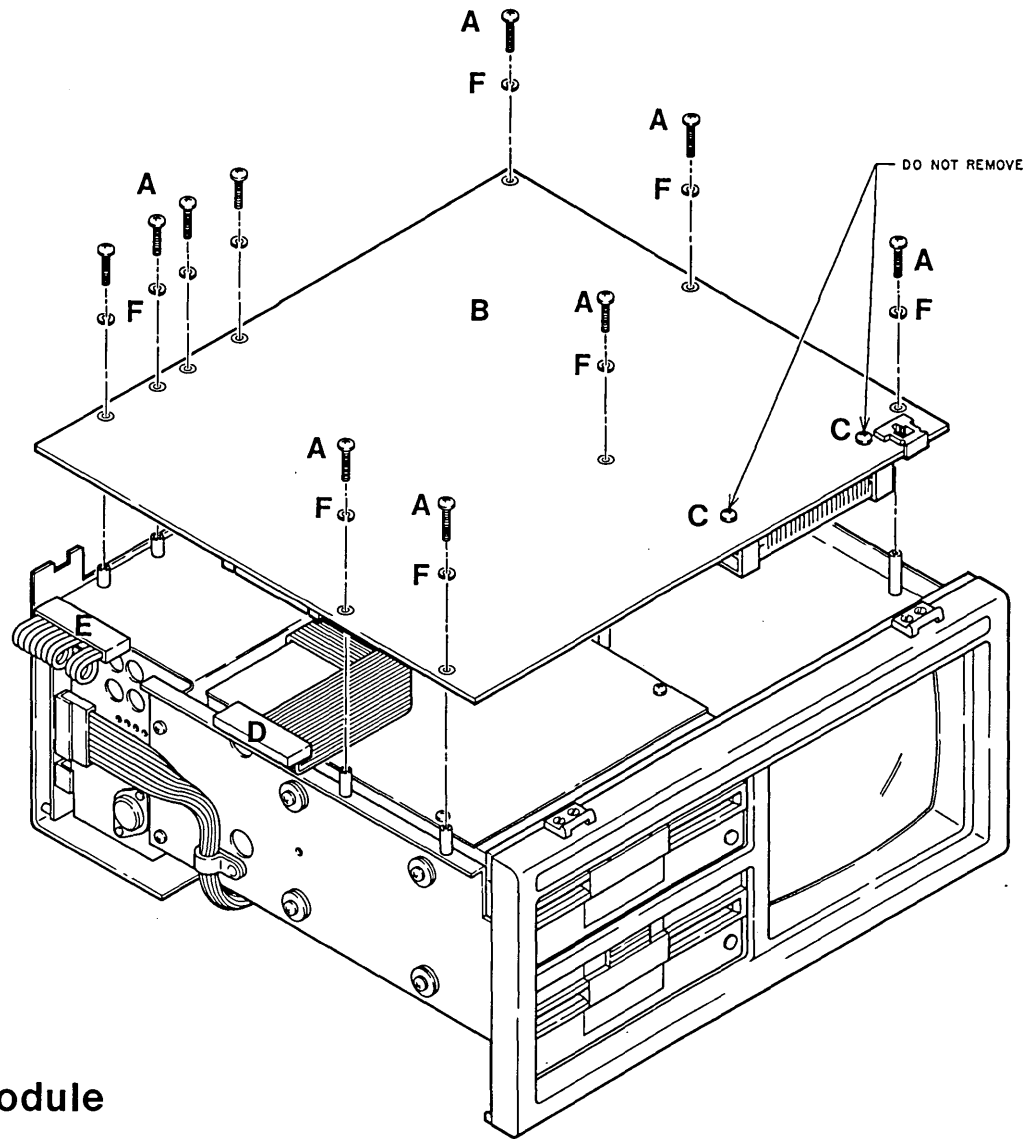
Standard jumpers locations for RS-232 are illustrated on the next page. Jumper locations are shaded on the diagram.

NOTE: J303, J305 1-3 and 4-6 may not appear on some processor board versions. Consult the Attache Technical Manual.

Processor Board Installation

1. With the unit upside down on a soft surface, place the processor board (B) onto the unit with the screw holes lined up.
2. Connect the 11-pin power supply cable (E) and check for correct installation.
3. Connect the disk drive flat-ribbon cable (D).
4. Insert all 10 #4-40 x .500 Phillips screws (A) and split-lock washers (F) and tighten.
5. Reinstall the cabinet.





Processor Board Module

Display Module (CRT) Removal

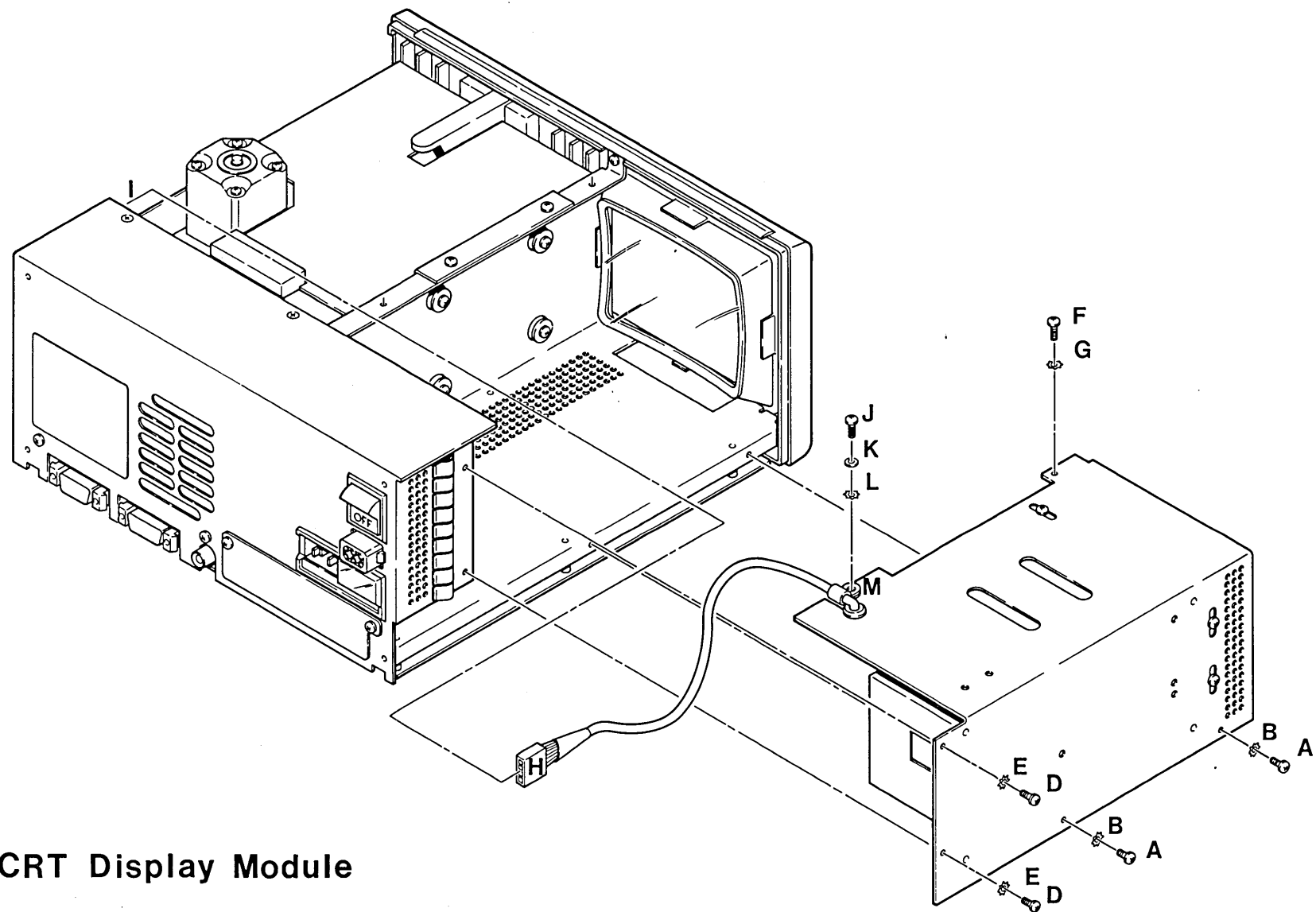
1. Remove the cabinet from the unit.
2. Remove the two #6-32 x .250 Phillips screws (A) with #6 star washers (B) from the mounting holes positioned on the lower left edge of the display module frame (C).
3. Remove the two #4-40 x .250 Phillips screws (D) with #4 star washers (E) from the mounting holes on the left rear edge of the display module frame.
4. Remove the # 6-32 x .250 Phillips screw (F) with #6 star washer (G) from the mounting hole located at the right forward edge of the display module frame.
5. Disconnect the power cable (H) from the 5-pin contact (I) at the left rear side of the unit. **BE SURE THE UNIT IS UNPLUGGED.**
6. Remove the #6-32 x .500 Phillips screw (J) with the #6 star washer (K) and #6 flat-washer (L) from the wire retaining clamp (M) and mounting hole.
7. Carefully angle the display module away from the system's face plate. Remove the display module from the chassis.

WARNING — HIGH VOLTAGE

HIGH VOLTAGE IS PRESENT WHENEVER ATTACHE IS POWERED ON. ALWAYS UNPLUG THE UNIT PRIOR TO REMOVING THE CRT DISPLAY MODULE.

Display Module (CRT) Installation

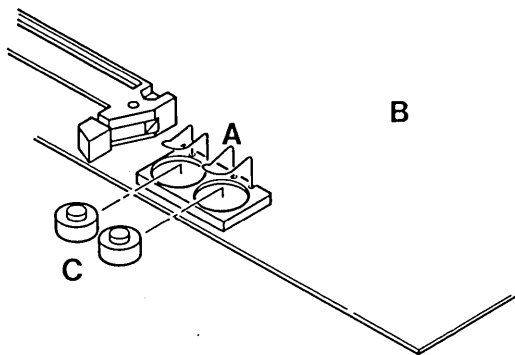
1. With the power cable (H) facing up and to the rear of the main unit, guide the display module (C) into the chassis, making certain the power cable is positioned correctly and not pinched between the chassis and display module frame.
2. Insert the two #6-32 x .250 Phillips screws (A) with #6 star washers (B) into the mounting holes positioned on the lower left edge of the display module frame and tighten.
3. Insert the two #4-40 x .250 Phillips screws (D) with #4 star washers (E) into the mounting holes on the left rear edge of the display module frame and tighten.
4. Insert the #6-32 x .250 Phillips screw (F) with #6 star washer (G) into the mounting hole located at the right forward edge of the display module frame and tighten.
5. Connect the power cable (H) to the 5-position contact (I) at the left rear side of the unit. **BE SURE THE UNIT IS UNPLUGGED.**
6. Gently push excess slack in the power cable into the display module (C) and position the wire retaining clamp (M) over the mounting hole adjacent to the point where the power cable enters the display module.
7. Insert the #6-32 x .500 Phillips screw (J) with the #6 star washer (K) and #6 flat-washer (L) through the wire retaining clamp and into the mounting hole and tighten.
8. Reinstall the cabinet.



CRT Display Module

Clock Battery Removal and Installation

The real-time clock uses two 1.5 volt silver oxide batteries (Duracell MS76 or equivalent), which are located on the right rear side of the processor board module.



Clock Batteries

1. Remove the cabinet from the unit.
2. Lift the retaining clips (A) on the right side of the processor board (B) and remove the batteries (C).
3. Install new batteries by lifting the retaining clips and inserting the new batteries.
4. Reinstall the cabinet.

Note: If the clock batteries require frequent replacement, you may need to replace the clock chip on the processor board. Consult the Attache Technical Manual.

Service Maps

Section 4

The service maps on the following pages are designed to help you isolate problems at the module level. These maps follow the troubleshooting process from preliminary problem identification through diagnostic analysis and the actual assembly and disassembly that is required for swapping the faulty module.

These maps are intended primarily for use by qualified dealer service personnel. Attache users will be able to follow the maps to the solution for most problems.

However, problems that are more complicated or involve more advanced troubleshooting techniques should be handled by qualified dealer service personnel. Areas that are shaded in the service maps indicate steps that should NOT be taken by the user.

Procedures that require swapping modules will, of course, depend on the availability of replacement modules. If you do not have access to another unit to use for swapping modules while testing a problem, return the unit to your dealer for service.

If you are in doubt or have any questions concerning these procedures, contact your dealer FIRST.